Report of Task Committee A
STRONG MOTIONS AND EFFECTS

Date: 20 February 2013
Place: National Institute of Standards and Technology, Gaithersburg, MD, USA

Attendees: U.S. Side -- Mehmet Celebi (Co-Chair) USGS
Asok Ghosh VA
Fred Lau VA
Steven McCabe NIST
Joy Pauschke NSF

Japan Side -- Izuru Okawa (Co-Chair) BRI
Masanori Iiba (Co-Chair) BRI

1. Objective and Scope of Work

The main objectives of the task committee are:
(1) To promote sharing of strong motion earthquake data among researchers and practicing engineers, and enhance the availability of technology for evaluating the destructive effects of earthquake motion.
(2) To promote, and when feasible, conduct collaborative research with other task committees of the Wind and Seismic Effects Panel on the dynamic behavior of structures.
(3) To promote and coordinate research on ground motion characterization, ground motion prediction and processing, and site-characterizations as applied to structural design considerations in building codes and other standards.

The scope of work includes:
(1) Exchange strong motion data and associated meta-data regularly and identify significant issues.
(2) Exchange information on technological developments, state-of-the-art and practice related to strong motion recording, archiving and processing, design ground motion estimation, hazard mapping, selection and modification of recordings for dynamic structural analysis, soil-structure interaction, soil behavior, and stability during earthquakes.
(3) Coordinate, and when feasible, plan and conduct programs of cooperative research and/or workshops in coordination with the proposed or ongoing programs. Disseminate results of workshops.

2. Accomplishments

(1) Information and data on the 2011 Great East Japan Earthquake were exchanged.
(2) Joint papers were published:
   a) Okawa, I., Kashima, T., Koyama, S., Iiba, M. and Çelebi, M. 2012, Summary of recorded building responses during the 2011 Off the Pacific Coast of Tohoku earthquake with some implications to design motions, Proc. of International Symposium on Engineering Lessons Learned from the Giant Earthquake, March 2012
repaired after the mainshock, Paper 0292, Proc. of 15th World Conference on Earthquake Engineering.

e) Çelebi, M. and Okawa, I., Drift issues of tall buildings during the March 11, 2011 M9.0 Tohoku earthquake, Japan - Implications, Paper presented during 44th UJNR Meeting (also to be submitted to journal).

3. Future Plans

(1) Joint studies on recorded motions obtained during the recent damaging earthquakes, including the 2011 Great East Japan Earthquake from buildings and other structures. The studies include/require:
   a) Exchange of data, meta-data related to the buildings and other structures from which data have been recorded.
   b) Understanding the effect of long-period ground motions to tall buildings and long-period structures.
   c) Determine the variation of structural characteristics of damaged buildings during the events.
   d) Study data for correlation with damage detection methodologies.
   e) Developing better instrumentation methods to obtain improved data during future events.
   f) Exchange of data on the near source ground motions to study impacts on design considerations.

(2) As a result of numerous recorded free-field data during the recent events:
   a) Study how they may affect design response spectra in Japan and the USA.
   b) Study site response issues, including topographical effect in particular, testing the transfer function procedures (e.g. Nakamura method)

(3) Exchange of information on the seismic hazard mapping for improving structural design

(4) Other activities as appropriate and events dictate

(5) Specifically during the next 2 years:
   a) Exchange further information and data on the 2011 Great East Japan Earthquake and other recent damaging earthquakes.
   b) Joint studies on building response and free field records.
   c) Exchange information on hazard mapping for building design.
   d) Look into reviving US-Japan UJNR SSI workshop within the next 2 years.
   e) Scaling for ground motions.
1. Objective and Scope of Work

(1) Objective:
The objective of the Task Committee is to improve the seismic performance of buildings in the U.S. and Japan, thus reducing future earthquake damage to buildings. This Task Committee accomplishes this objective by promoting sharing technical information, performing appropriate cooperative research, exchanging personnel to address common issues, and working together to translate research results into the seismic provisions of codes and standards in the U.S. and Japan.

(2) Scope of Work:
   a) Conduct joint workshops and meetings to identify new technical information and possible research cooperation/collaboration for the development of improved codes and standards.
   b) Encourage the development, enhancement and application of new technologies and design methods to improve safety, sustainability and productivity of buildings and to improve the resilience of buildings and infrastructure.
   c) Coordinate development of databases, test procedures, and guidelines for interpretation of test results and their applications.
   d) Coordinate joint research including the utilization of experimental facilities.
   e) Enhance the exchange of information and personnel.

2. Accomplishments

(1) The Task Committee conducted a U.S.-Japan joint reconnaissance on damaged buildings due to shaking of the 2011 Great East Japan Earthquake from August 31 through September 1, 2011 to investigate damage to retrofitted buildings, seismically isolated buildings, and buildings designed based on the current code or the previous code in Japan. A workshop on motion induced building damage was also conducted in Tohoku University with Prof. M. Maeda.

(2) Based on the August 2011 meeting, the US and Japan Buildings Task Committee groups began programs to study the behavior of reinforced concrete structural shear walls. This was identified as a priority for future collaboration.

3. Future Plans

(1) Create joint research between the US and Japan to develop and improve numerical models of structural elements and systems and to exchange experimental and field data. The following topics
have been identified as areas of future research collaboration on building structures:

a) Performance of RC structural shear walls; this is a priority.
b) Study of earthquake duration effects on structural performance; the relationship between the number of strong cycles of response and level of damage. This subject is an important part of Item a).
c) Resonant response of high-rise buildings and seismically isolated buildings to long-period earthquake ground motion. This will be a Task Committee A & B joint activity.
d) Examine the performance of seismically isolated buildings; summarize experience in US and Japan and modeling issues associated with this system.

(2) Exchange technical information on the following topics.

a) The strong motion data recorded in the buildings and its drawings
b) Structural performance data obtained by the tests conducted.
c) Provide links on NIST data repository when available.

(3) Future workshops, "U.S.-Japan Workshop on the Performance of RC Structural Shear Walls", will be developed to share technical information about the US and Japan research in this area. This information can be reflected within the technical codes and standards of the respective countries. Participation by Chilean engineers and researchers is also to be considered.
1. Objective and Scope of Work

To promote better understanding of the response of dams to dynamic loads, the T/C will identify, coordinate, and support initiatives by government agencies, private sector, universities, research centers, and professional organizations to advance the safety and resilience of these critical structures, improve their performance under dynamic loading, promote effective remediation measures, and support emergency preparedness efforts.

The scope of work includes:

(1) Identify, review, and assess methods for dynamic analysis and performance evaluation of dams and related critical infrastructure (such as hydropower generation facilities, navigation structures, and flood risk reduction systems).
   a) Assessment of models and numerical procedures used for non-linear response analysis of dams and related critical infrastructure.
   b) Definition of input ground motions for non-linear seismic analysis.
   c) Assessment of performance-based design and analysis approaches.
   d) Development of effective counter-measures and retrofit alternatives to improve the performance under extreme dynamic loads.

(2) Identify, review, and assess physical modeling efforts supporting dynamic analysis and performance evaluation of dams and related critical infrastructure.
   a) Determination of strength and deformation characteristics of concrete, soil, and rock materials under dynamic conditions.
   b) Experimental evaluation of non-linear performance (e.g., shake table testing, centrifuge testing, etc.).

(3) Evaluate observed performance during earthquakes.
   a) Development, review, and calibration empirical techniques for simplified assessment.
   b) Review observed failure and damage mechanisms to improve the development of advanced numerical models.
   c) Application of the analysis of the observed dynamic behavior to the improvement of design and evaluation criteria.

(4) Identify, review, and assess approaches to enhance emergency preparedness and mitigate potential consequences associated with incidents or events affecting dams and related critical infrastructure.
   a) Evaluation of models and numerical procedures used for flood inundation modeling.
   b) Evaluation of models and numerical procedures used for consequence estimation (human impacts and economic impacts).
   c) Assessment of emergency preparedness approaches, including emergency action planning and exercises.

(5) Collaborate with universities, research centers, and professional organizations to promote information sharing across the dam engineering community.
2. Accomplishments

(1) Technical exchange and collaborative research on \textit{Nonlinear Response Analysis and Discrete Element Method Analyses of Concrete Dams} has been conducted between the U.S. (U.S. Army Engineer Research and Development Center) and Japan (Public Works Research Institute). Shaking table experiments for crack-segmented concrete specimens considering the uplift pressure in a crack were successfully conducted at PWRI in 2009 and 2010. The U.S. Bureau of Reclamation is continuing efforts in nonlinear response analyses, and the joint comparison and evaluation of test and analysis results will be extremely beneficial to advance the state of the art in constitutive modeling of mass concrete structures.

(2) Technical exchange and collaborative research on \textit{Experimental Characterization of Nonlinear Tensile Behavior of Mass Concrete} has been conducted between U.S. (U.S. Army Engineer Research and Development Center and U.S. Bureau of Reclamation) and Japan (Public Works Research Institute).

(3) The Task Committee extended an invitation to professional organizations, such as the U.S. Society on Dams and Japan Commission on Large Dams, to actively participate as members of the Task Committee by designating the corresponding representatives. The Task Committee has incorporated several new members from these professional organizations.

(4) The Task Committee conducted a U.S.-Japan joint reconnaissance on four dams damaged due to the 2011 Great East Japan Earthquake from August 31 through September 2, 2011.

3. Future Plans

(1) The Task Committee will continue current efforts focused on the development of improved mechanisms to facilitate the continuous exchange of results of research activities and general technical information related to the dynamic performance of dams and related critical infrastructure.

(2) The Task Committee will coordinate exchange visits of scientists and engineers from the U.S. and Japan. A series of case histories of mutual interest will be identified and prioritized and they will serve as the focus for this exchange program.

(3) The Task Committee will identify and promote collaborative opportunities on the following research areas:

   a) \textbf{Criteria for seismic analysis progression:}
      The Task Committee will support the review and comparison of the state of practice in the U.S. and Japan regarding current recommendations for seismic analysis based on a systematic progression of analysis stages increasing in complexity.

   b) \textbf{Seismic evaluation of embankment dams:}
      The Task Committee will support the review of criteria and guidelines for post-earthquake stability and deformation analysis of embankment dams.

   c) \textbf{Dam-foundation interaction:}
      The Task Committee will support the development of improved numerical models for dam-foundation interaction.

   d) \textbf{Risk Assessment and Consequence Estimation:}
      The Task Committee will support technical exchange and comparison studies related to risk assessment methodologies and consequence estimation models for dams and related critical infrastructure.

   e) \textbf{Flood Inundation Modeling:}
      The Task Committee will support the review of the state of practice regarding numerical simulation techniques for flood inundation modeling.


(5) The Task Committee will pursue collaborative efforts with the professional organizations, such as the U.S. Society on Dams and Japan Commission on Large Dams, and will seek to hold joint workshops, seminars, and other means of technical exchange in conjunction with their regularly scheduled
conferences and annual meetings.

(6) The Task Committee will approach the Committee on Earthquakes of the U.S. Society on Dams regarding the possibility of conducting a joint workshop in conjunction with the International Commission on Large Dams Annual Meeting to be held in Seattle, USA, during August 12-16, 2013. Workshop details will be determined through correspondence between the Chairs of these two committees.

(7) The Task Committee will explore future collaboration opportunities with the Committee on Computational Aspects of Analysis and Design of Dams of the International Commission on Large Dams. Task Committee members will participate at the 12th International Benchmark Workshop on Numerical Analysis of Dams, to be held in Graz, Austria, during October 2-4, 2013, to discuss potential collaboration efforts.
Report of Task Committee D
WIND ENGINEERING

Date: 20 February 2013
Place: National Institute of Standards and Technology, Gaithersburg, MD, USA

Attendees:

U.S. Side -- Marc Levitan (Co-Chair) NIST
Partha Sarkar (Co-Chair) (via teleconference) ISU
Luca Caracoglia NEU
Kishor Mehta NSF

Japan Side -- Yasuo Okuda (Co-Chair) NILIM
Hitoshi Yamada (Co-Chair) YNU

1. Objective and Scope of Work

To exchange technical information and to jointly plan, promote, and foster research and dissemination, in order to improve understanding of wind and its effects on structures, to establish more rational wind-resistant design procedures for structures, and to contribute collaboratively and synergistically to wind hazard mitigation. Specific objectives for the Task Committee include:

(1) Strategically and collaboratively, identify research needs in wind hazard mitigation in the areas of new impacts of wind events.

(2) Facilitate cooperation and collaborative research between U.S. and Japanese researchers in wind engineering.

(3) Identify and exchange successes in wind engineering and wind hazard mitigation.

The scope of the US-Japan collaboration includes:

(1) Characterization of strong wind, especially boundary layer extreme winds.

(2) The study of wind effects including wind loading on and wind-induced response of structures.

(3) Performance of experimental and analytical research to predict wind effects.

(4) Sharing damage surveys of wind hazard and storm surge and risk assessments in cooperation with Task Committee H.

(5) Development of new technologies for wind hazard mitigation.

2. Accomplishments

(1) Japan side Task Committee members shared information on tornado damage in Tsukuba City on May 6, 2012.

(2) US side Task Committee members shared information on tornado damage in Joplin Missouri on May 22, 2011.

(3) Follow-up study on the US-side, based on data from the "US-Japan Benchmark Study on Flutter Derivatives". (a) One journal paper published by researchers from Northeastern University (Seo and Caracoglia, Engineering Structures, 33 (2011) 2284–2296; (b) Short paper to be included in the proceedings of the 44th Panel Meeting from Northeastern University.

(4) Two workshops were held in November 2011 (Northeastern University, Boston, MA) and in March 2012 (Texas Tech University) in the United States on "Structural Dynamics and Monitoring of Bridges and Flexible Structures against Wind Hazards".

(5) A joint US-Japan manuscript was recently completed for submission to the ASCE Journal Natural Hazards Review titled "Wind-speed estimation and post-disaster recovery of building damage in the 2008 EF5-Tornado in Iowa, USA" by H. Kikitsu, BRI, Japan and P. P. Sarkar, ISU, USA (a Japanese version of this paper was published earlier: Kikitsu, H. and Sarkar, P. P. "Damage to Buildings by EF5 Tornado in Iowa, U.S. on May 25, 2008", Wind Engineers, JAWE, 33(4), 345-356). The above papers
are a result of a joint effort and damage survey of the Parkersburg, Iowa, EF5-tornado in 2008.

(6) A tornado simulator based on the design of Iowa State University Tornado Simulator was constructed in 2010-11 at the Building Research Institute, Tsukuba, Japan, under the supervision of Dr. H. Kikitsu in collaboration with Partha Sarkar of ISU, to conduct research on tornado-induced wind loads at BRI.

3. Future Plans

(1) The 6th US-Japan Workshop on Wind Engineering will be held in Yokohama in 2014. Discussion on the planning of this meeting:
   a) Propose to focus on few research items:
      • Tornadoes
      • Wind and wind-rain induced stay-cable vibration on long-span bridges
      • Performance of buildings under extreme wind loads
      • Wind energy systems
   b) Planning of the meeting is under way:
      • Two-day technical workshop and one day of technical tours
      • Optimal dates: third week of May in 2014 (possibly combining the UJNR Workshop with meeting of Japanese Association for Wind Engineering)

(2) Conduct collaborative research on the following topics. More concrete subjects were proposed at 5th US-Japan workshop in 2010.
   a) Wind effects on buildings and wind energy systems (land based and offshore)
      → Continuation of ongoing collaborative study of tornadic flow and effects on buildings structures
   b) Wind effects on bridges
      → Follow-up of benchmark study on flutter derivatives
   c) Evolving Technologies
      → Development of collaborative research on emerging innovative techniques for laboratory modeling and instrumentation

(3) Exchange technical information on the following topics.
   a) Wind characteristics and wind hazards
      → Conduct study on the urban flow using CFD simulation of flow over the cities
   b) Wind pressures, loadings and performance of buildings
      → Development of database of pressures on roofs and solar panels, resulting from comparative study carried out in Japan
   c) Wind-induced response of flexible, cable-suspended bridges and their components
   d) New prediction and mitigation techniques for wind effects
      → Use Cp pressure coefficient of hip roof and parapet
   e) Share the database of storm damage assessments with Task Committee H.
      → Establish wind induced damage database for buildings and infrastructure in Japan and US

(4) Engage in more regular interaction and communication among Task Committee members. Use email and exchange visits between full Panel meetings were suggested as a means of facilitating and coordinating collaborative activities.

(5) Exchange of graduate students for short-term (summer) projects at research institutions on both sides should be pursued.

4. Related Activities


(2) The ASCE 7 Wind Load subcommittee began work in 2012 on a revision to the wind loading provisions of the ASCE 7 standard, to be published in 2016.
Report of Task Committee G
TRANSPORTATION SYSTEMS

Date: 20 February 2013

Place: National Institute of Standards and Technology, Gaithersburg, MD, USA

Attendees: U.S. Side -- W. Phillip Yen (Chair) FHWA
Japan Side -- Tetsurou Kuwabara (Chair) PWRI
Jun-ichi Hoshikuma PWRI

1. Objective and Scope of Work

The objectives of work include:
(1) To plan, promote and foster research on the behavior of transportation facilities when subjected to wind and seismic forces, and
(2) To disseminate research results and provide specifications and guidelines based on the Task Committee's findings.

The scope of work includes:
(1) To investigate existing and new bridges design, the behavior of whole bridge systems and/or single component of a bridge without limitation on their size and function.
(2) Personnel exchange for young engineers in sharing research activities and technical information.

2. Accomplishments

(1) The proceedings of the 27th US-Japan Bridge Engineering Workshop, which was held during 7-9 November 2011, in Tsukuba, Japan, were printed and distributed. The program and papers of the workshop were posted on the website of the Panel on Wind and Seismic Effects, UJNR at PWRI (http://www.pwri.go.jp/eng/ujnr/te/g/te_g.htm) and FHWA.
(2) The 28th US-Japan Bridge Engineering Workshop was held during 8-10 October 2012, in Portland, OR, U.S. The proceedings of this Workshop will be printed and distributed. The program and papers of the workshop will be posted on the website of the Panel on Wind and Seismic Effects, UJNR at PWRI and FHWA.
(3) The report of joint reconnaissance of highway bridge damage due to the 2011 Great East Japan Earthquake, which was performed during 3-6 June 2011, was posted on the website of the Task Committee G, Panel on Wind and Seismic Effects, UJNR, so that the selected significant pictures in high resolution format can be downloaded by worldwide researchers and engineers.
(4) Dr. Phillip Yen visited PWRI on 5 March 2012 to observe the experimental test of the tsunami effect on bridges and exchanged the technical information on the tsunami effect with PWRI.
(5) Prof. Kazuhiko Kawashima visited New Orleans, LA on 17 and 18 March 2012 and investigated the I-10 bridges damaged by 2005 Hurricane Katrina.
(6) Mr. Zenchary B. Haber, Ph. D. candidate, University of Nevada, Reno, visited PWRI on 31 August 2012 and exchanged the technical information on the seismic performance of the precast segmental bridge columns with PWRI.
(7) Both sides started the U.S.-Japan collaborative researches on study of tsunami effects on bridge performance.

3. Future Plans

(1) The 29th US-Japan Bridge Engineering Workshop will be held in October 2013, in Tsukuba, Japan. Specific program and itinerary will be proposed by the Japan-side Task Committee G with the
(2) Following a devastating earthquake or hurricane (typhoon) in the US or Japan, the committee will form a joint reconnaissance team to investigate the performance of transportation systems.

(3) With increasing concerns over structural member fractures of older bridges in the US and Japan, the committee will conduct joint efforts to investigate detection methods, causes and repairs. The joint efforts should be initiated by the hosting side.

(4) Both sides agreed to conduct joint researches and share technical information on the following topics.
   a) Strategy to determine design criteria, design loads, and load factors that consider ductility and redundancy for multiple hazards
   b) Best and poor practices in bridge design and maintenance
   c) Post earthquake response and repair
   d) Study on policy making to set different performance levels of routes and allocate resources for seismic upgrading/retrofit, bridge inspection, and rehabilitation based on the assigned characteristics
   e) Impact of seismic design of long duration earthquakes
   f) Applications of high performance materials (Nano, SMA and UHPC) in seismic design and retrofitting
   g) Study of tsunami effects on bridge performance in cooperation with Task Committee H

4. Related Activities

None.
Report of Task Committee H
STORM SURGE AND TSUNAMI

Date: 20 February 2013
Place: National Institute of Standards and Technology, Gaithersburg, MD, USA

Attendees:
U.S. Side -- Marc Levitan (Chair) NIST
Kishor Mehta NSF

Japan Side -- Takashi Tomita (Chair) PARI
Yasuo Okuda NILIM

1. Objective and Scope of Work

The objectives of work include:
(1) To exchange scientific and technical information
(2) To jointly plan, promote and foster research and dissemination of knowledge
(3) To develop measures to prevent and mitigate damages from storm surges and tsunamis

The scope of work includes:
(1) Perform joint research on storm surge and tsunami occurrences, generation, propagation, and coastal effects. Develop database on storm surge, tsunami and wave measurements.
(2) Improve coordination of strategies and systems for observations of storm surges and tsunamis by field surveys, satellites, and in-situ measurements.
(3) Exchange results and status of storm surge and tsunami mitigation activities including analysis of the problem, planning, warning, and engineering approaches.
(4) Exchange information on development of technologies including numerical models to predict propagation processes, landfall locations, inundation and run-up heights, and wave characteristics, improved instrumentation, and use of satellite communication for detection and warning.
(5) Facilitate research result and technology development disseminations through exchange of literature, technical reports at joint meetings, special workshops, joint projects, and direct interaction among participants.
(6) Develop planning, design and construction guidelines in storm surge and tsunami flooding zones to serve as a model for international standards.
(7) Provide technical support to develop storm surge and tsunami mitigation programs worldwide.
(8) Encourage conduct of joint investigation following storm surge and tsunami events in cooperation with Task Committees D and G.

2. Accomplishments

(1) Collaboration with T/C G on Bridges on tsunami impact design is in progress.
(2) Japan side members are participating with US side T/C members on the committee developing tsunami design provisions for the ASCE 7 standard applicable to buildings and other structures.
(3) Panel members of both US and Japan participated in numerical simulations of tsunami propagation and structural damage of the 2011 Great East Japan Earthquake Tsunami.
(4) Panel members of both US and Japan exchanged information on tsunami loads on buildings.
(5) Panel members from the US side exchanged information on Hurricane Sandy storm surge flooding.

3. Future Plans

(1) Create joint research between the US and Japan to develop and improve numerical models of storm surge and tsunami dynamics and to exchange experimental and field data. The following topics have
been identified as areas of future research collaboration on storm surges and tsunamis:

a) field observation
b) characterization
c) physical experiment models
d) numerical simulation models
e) effects on coastal structures and damage estimations
f) design of protective structures for different levels
g) hazard maps development and warning system design
h) storm surge and tsunami information communication and warning systems development
i) risk assessment including hazard beyond designed levels

(2) Develop database for existing and planned experiments including description and parameters of experiments to maximize overall available experimental data for understanding of physical behavior, numerical model validation and structural design.

(3) Include the effects of global warming on atmospheric and oceanographic environmental conditions leading to changes in the probability of occurrence and intensity of typhoons, cyclones and hurricanes, and sea level rise. These changes in typhoon and sea level characteristics will directly influence the characteristics and induced damages of future storm surges and tsunamis.

(4) Collaborate with T/C D on Winds to develop storm surge research.

(5) Explore possibility of holding a UJNR Panel Meeting at a future natural hazard conference.

4. Related Activities

(1) Japan side T/C members have cooperative research activities with the Technical Committee on Estimation and Reduction Technologies on Multi-Hazards of Earthquake and Tsunami, Japan Society of Civil Engineers and the Working Group of Tsunami Loads, Architectural Institute of Japan.

(2) Japan side T/C members have cooperation with Japan local and central government on planning of recovery and reconstruction policies, and improvement of design codes of buildings, bridges and other structures.

(3) US side T/C members have several on-going research projects on tsunami and storm surge numerical modeling and experiments at the HWRL of OSU, and research at NIST on risk quantification for design of coastal structures exposed to combined hurricane wind and storm surge effects.